

WHAT IS CLAIMED IS:

1. An apparatus for transmitting (Transport Format Combination Indicator) TFCI bits in a (Code Division Multiple Access) CDMA mobile communication system including a UE (User Equipment) and a Node B for transmitting packet data to the UE over the first channel, encoding TFCI bits depending on information bits of the first channel and information bits of a second channel established to transmit the packet data over first channel, and transmitting the encoded TFCI bits over the second channel, comprising:
 - 10 a first TFCI bit generator for creating first TFCI bits depending on information bits of the first channel;
 - a second TFCI bit generator for creating second TFCI bits depending on information bits of the second channel; and
 - an encoder for encoding the first TFCI bits and the second TFCI bits and
 - 15 puncturing the encoded first TFCI bits and second TFCI bits according to first and second puncturing positions respectively such that a remained number of encoded first TFCI bits to a remained number of encoded second TFCI bits is variable based upon the ratio of the first TFCI bits and the second TFCI bits.
- 20 2. The apparatus as claimed in claim 1, wherein the first channel is a downlink shared channel (DSCH) and the second channel is a dedicated channel (DCH).
3. The apparatus as claimed in claim 1, wherein the first puncturing positions are 1st, 3rd, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th, 31st coded symbols among a total of 32 encoded first symbols of 0th to 31st symbols and second puncturing positions are 0th, 2nd, 8th, 19th and 20th coded symbols among a total of 32 encoded second symbols of 0th to 31st symbols when the number of first TFCI bits is 1 and the
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 number of second TFCI bits are 9.
4. The apparatus as claimed in claim 1, wherein the first puncturing

positions are 3rd, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded first symbols of 0th to 31st symbols and second puncturing positions are 1st, 7th, 13th, 15th, 20th, 25th, 30th and 31st coded symbols among a total of 32 encoded second symbols of 0th to 31st symbols when the number of first TFCI bits are 2 and the number of second TFCI bits are 8.

5. The apparatus as claimed in claim 1, wherein the first puncturing positions are 7th, 8th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded first symbols of 0th to 31st symbols and second puncturing positions are 0th, 1st, 2nd, 3rd, 4th, 5th, 7th, 12th, 18th, 21st, 24th coded symbols among a total of 32 encoded second symbols of 0th to 31st symbols when the number of first TFCI bits are 3 and the number of second TFCI bits are 7.

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6. The apparatus as claimed in claim 1, wherein the first puncturing positions are 0th, 1st, 2nd, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded first symbols of 0th to 31st symbols and second puncturing positions are 0th, 7th, 9th, 11th, 16th, 19th, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded second symbols of 0th to 31st symbols when the number of first TFCI bits are 4 and the number of second TFCI bits are 6.

7. An apparatus for encoding TFCI(Transport Format Combination Indicator) bits in a CDMA mobile communication system including a UE and a Node B for transmitting packet data to the UE over a first channel, encoding TFCI bits depending on information bits of the first channel and information bits of a second channel established to transmit the packet data over the first channel, and transmitting the encoded TFCI bits over the second channel, comprising:

30 a TFCI bit generator for creating the TFCI bits, the number of which is variable depending on an information bit ratio of the first channel to the second channel;

a code length information generator for generating code length information for

setting a length of a codeword according to the information bit ratio;

a Walsh code generator for generating first to fifth basis Walsh codewords;

a sequence generator for generating an all-1 sequence;

a mask generator for generating first to fourth basis masks;

5 first to tenth multipliers for multiplying the TFCI bits by the first to fifth basis Walsh codewords, the all-1 sequence and the first to fourth basis masks, respectively;

an adder for adding outputs of the first to tenth multipliers; and

a puncturer for puncturing a codeword output from the adder according to the code length information.

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8. The apparatus as claimed in claim 7, wherein the first channel is a downlink shared channel (DSCH) and the second channel is a dedicated channel (DCH).

9. An apparatus for encoding TFCI(Transport Format Combination
15 Indicator) bits depending on an information bit ratio of a first channel to a second channel in a CDMA mobile communication system, comprising:

a first encoder for encoding a first TFCI bits representing a transport format combination of the first channel to generate first encoded symbols, and puncturing the first encoded symbols according to a predetermined first puncturing positions;

20 a second encoder for encoding a second TFCI bits representing a transport format combination of the second channel to generate second encoded symbols, and puncturing the second encoded symbols according to a predetermined second puncturing positions; and

a multiplexer for multiplexing the output symbols of the first and second
25 encoders to transmit the symbols on the second channel.

10. The apparatus as claimed in claim 9, wherein the first TFCI bits are TFCI bits for a DSCH and the second TFCI bits are TFCI bits for a DCH.

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11. The apparatus as claimed in claim 9, wherein the first puncturing positions are 1st, 3rd, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th,

19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th, 31st coded symbols among a total of 32 encoded first symbols of 0th to 31st symbols and second puncturing positions are 0th, 2nd, 8th, 19th and 20th coded symbols among a total of 32 encoded second symbols of 0th to 31st symbols when the number of first TFCI bits is 1 and the
5 number of second TFCI bits are 9.

12. The apparatus as claimed in claim 9, wherein the first puncturing positions are 3rd, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of
10 32 encoded first symbols of 0th to 31st symbols and second puncturing positions are 1st, 7th, 13th, 15th, 20th, 25th, 30th and 31st coded symbols among a total of 32 encoded second symbols of 0th to 31st symbols when the number of first TFCI bits are 2 and the number of second TFCI bits are 8.

13. The apparatus as claimed in claim 9, wherein the first puncturing positions are 7th, 8th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded first symbols of 0th to 31st symbols and second puncturing positions are 0th, 1st, 2nd, 3rd, 4th, 5th, 7th, 12th, 18th, 21st, 24th coded symbols among a total of 32 encoded second
20 symbols of 0th to 31st symbols when the number of first TFCI bits are 3 and the number of second TFCI bits are 7.

14. The apparatus as claimed in claim 9, wherein the first puncturing positions are 0th, 1st, 2nd, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th,
25 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded first symbols of 0th to 31st symbols and second puncturing positions are 0th, 7th, 9th, 11th, 16th, 19th, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded second symbols of 0th to 31st symbols when the number of first TFCI bits are 4 and the number of second TFCI bits are 6.

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15. An apparatus for receiving TFCI(Transport Format Combination

Indicator) bits in a CDMA mobile communication system including a UE and a Node B for transmitting packet data to the UE over a first channel, encoding TFCI bits for the first channel into first TFCI symbols and TFCI bits for the second channel established to transmit control information for the first channel into second TFCI symbols, and
 5 transmitting the first and second TFCI symbols over the second channel, comprising:

a demultiplexer for demultiplexing received TFCI symbols into a first TFCI symbols and a second TFCI symbols; and

a decoder for inserting zeros in the first TFCI symbols and the second TFCI symbols at first and second predetermined positions respectively, and decoding the zero-
 10 inserted first and second TFCI symbols by using inverse fast Hadamard transform (IFHT).

16. The apparatus as claimed in claim 15, wherein the first channel is a downlink shared channel (DSCH) and the second channel is a dedicated channel (DCH).
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17. The apparatus as claimed in claim 15, wherein the first positions are 1st, 3rd, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th, 31st coded symbols among a total of 32
 20 encoded first symbols of 0th to 31st symbols and the second positions are 0th, 2nd, 8th, 19th and 20th coded symbols among a total of 32 encoded second symbols of 0th to 31st symbols when the number of first TFCI bits is 1 and the number of second TFCI bits are 9.

25 18. The apparatus as claimed in claim 15, wherein the first positions are 3rd, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded first symbols of 0th to 31st symbols and the second positions are 1st, 7th, 13th, 15th, 20th, 25th, 30th and 31st coded symbols among a total of 32 encoded second symbols of 0th to
 30 31st symbols when the number of first TFCI bits are 2 and the number of second TFCI bits are 8.

19. The apparatus as claimed in claim 15, wherein the first positions are 7th, 8th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded first symbols of 0th to 31st symbols and the second positions are 0th, 1st, 2nd, 3rd, 4th, 5th, 7th, 12th, 18th, 21st, 24th coded symbols among a total of 32 encoded second symbols of 0th to 31st symbols when the number of first TFCI bits are 3 and the number of second TFCI bits are 7.

20. The apparatus as claimed in claim 15, wherein the first positions are 0th, 1st, 2nd, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded first symbols of 0th to 31st symbols and the second positions are 0th, 7th, 9th, 11th, 16th, 19th, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded second symbols of 0th to 31st symbols when the number of first TFCI bits are 4 and the number of second TFCI bits are 6.

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21. A method for transmitting TFCI(Transport Format Combination Indicator) bits in a CDMA mobile communication system including a UE and a Node B for transmitting packet data to the UE over a first channel, first and second encoded TFCI bits over a second channel established to transmit control data for the first channel, comprising the steps of:

encoding a first TFCI bits representing a transport format combination of the first channel to generate first encoded symbols and a second TFCI bits representing a transport format combination of the second channel to generate second encoded symbols respectively; and

25 puncturing the first encoded symbols and the second encoded symbols according to first and second puncturing positions to generate the first encoded TFCI bits and the second encoded TFCI bits;

multiplexing the first encoded TFCI bits and the second encoded TFCI bits; and

30 transmitting the multiplexed encoded TFCI bits over the second channel.

22. The method as claimed in claim 21, wherein the first channel is a

downlink shared channel (DSCH) and the second channel is a dedicated channel (DCH).

23. The apparatus as claimed in claim 21, wherein the first puncturing positions are 1st, 3rd, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th, 31st coded symbols among a total of 32 encoded first symbols of 0th to 31st symbols and the second puncturing positions are 0th, 2nd, 8th, 19th and 20th coded symbols among a total of 32 encoded second symbols of 0th to 31st symbols when the number of first TFCI bits is 1 and the number of second TFCI bits are 9.

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24. The apparatus as claimed in claim 21, wherein the first puncturing positions are 3rd, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded first symbols of 0th to 31st symbols and the second puncturing positions are 1st, 7th, 13th, 15th, 20th, 25th, 30th and 31st coded symbols among a total of 32 encoded second symbols of 0th to 31st symbols when the number of first TFCI bits are 2 and the number of second TFCI bits are 8.

25. The apparatus as claimed in claim 21, wherein the first puncturing positions are 7th, 8th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded first symbols of 0th to 31st symbols and the second puncturing positions are 0th, 1st, 2nd, 3rd, 4th, 5th, 7th, 12th, 18th, 21st, 24th coded symbols among a total of 32 encoded second symbols of 0th to 31st symbols when the number of first TFCI bits are 3 and the number of second TFCI bits are 7.

26. The apparatus as claimed in claim 21, wherein the first puncturing positions are 0th, 1st, 2nd, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded first symbols of 0th to 31st symbols and the second puncturing positions are 0th, 7th, 9th, 11th, 16th, 19th, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded second symbols of 0th to 31st symbols when the number of first TFCI bits are 4 and the

number of second TFCI bits are 6.

27. A method for receiving TFCI(Transport Format Combination Indicator) bits in a CDMA mobile communication system including a UE and a Node
5 B for transmitting packet data to the UE over a first channel, first and second encoded TFCI bits over a second channel established to transmit control data for the first channel, comprising the steps of:

demultiplexing received encoded TFCI bits into the first encoded TFCI bits and the second encoded TFCI bits;

10 inserting zeros in the first encoded TFCI bits and second encoded TFCI bits at first and second predetermined positions respectively; and

decoding the zero-inserted first and second TFCI bits.

28. The method as claimed in claim 27, wherein the first channel is a
15 downlink shared channel (DSCH) and the second channel is a dedicated channel (DCH).

29. The apparatus as claimed in claim 27, wherein the first positions are
1st, 3rd, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st,
22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th, 31st coded symbols among a total of 32
20 encoded first symbols of 0th to 31st symbols and the second positions are 0th, 2nd, 8th,
19th and 20th coded symbols among a total of 32 encoded second symbols of 0th to
31st symbols when the number of first TFCI bits is 1 and the number of second TFCI
bits are 9.

25 30. The apparatus as claimed in claim 27, wherein the first positions are
3rd, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd,
24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded
first symbols of 0th to 31st symbols and the second positions are 1st, 7th, 13th, 15th, 20th,
25th, 30th and 31st coded symbols among a total of 32 encoded second symbols of 0th to
30 31st symbols when the number of first TFCI bits are 2 and the number of second TFCI
bits are 8.

31. The apparatus as claimed in claim 27, wherein the first positions are 7th, 8th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded first symbols of 0th to 31st symbols and the second positions are 0th, 1st, 2nd, 3rd, 4th, 5th, 7th, 12th, 18th, 21st, 24th coded symbols among a total of 32 encoded second symbols of 0th to 31st symbols when the number of first TFCI bits are 3 and the number of second TFCI bits are 7.

32. The apparatus as claimed in claim 27, wherein the first positions are 0th, 1st, 2nd, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded first symbols of 0th to 31st symbols and the second positions are 0th, 7th, 9th, 11th, 16th, 19th, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded second symbols of 0th to 31st symbols when the number of first TFCI bits are 4 and the number of second TFCI bits are 6.

33. A method for encoding TFCI bits for a first channel and TFCI (Transport Format Combination Indicator) bits for a second channel depending on an information bits ratio of the first channel to the second channel first channel TFCI and the second channel TFCI in a CDMA mobile communication system, comprising the steps of:

creating m first TFCI bits based on data of the first channel and n second TFCI bits based on data of the second channel;

encoding the first TFCI bits and puncturing the encoded first symbols according to a first puncturing positions of the first channel to generate first encoded TFCI symbols;

encoding the second TFCI bits, and puncturing the encoded second symbols according to a second puncturing positions of the second channel to generate second encoded TFCI symbols; and

multiplexing the first encoded TFCI symbols and the second encoded TFCI symbols so as to uniformly distribute the first and second TFCI symbols.

34. The apparatus as claimed in claim 33, wherein the first puncturing positions are 1st, 3rd, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th, 31st coded symbols among a total of 32 encoded first symbols of 0th to 31st symbols and the second puncturing positions are 0th, 2nd, 8th, 19th and 20th coded symbols among a total of 32 encoded second symbols of 0th to 31st symbols when the number of first TFCI bits is 1 and the number of second TFCI bits are 9.

35. The apparatus as claimed in claim 33, wherein the first puncturing positions are 3rd, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded first symbols of 0th to 31st symbols and the second puncturing positions are 1st, 7th, 13th, 15th, 20th, 25th, 30th and 31st coded symbols among a total of 32 encoded second symbols of 0th to 31st symbols when the number of first TFCI bits are 2 and the number of second TFCI bits are 8.

36. The apparatus as claimed in claim 33, wherein the first puncturing positions are 7th, 8th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded first symbols of 0th to 31st symbols and the second puncturing positions are 0th, 1st, 2nd, 3rd, 4th, 5th, 7th, 12th, 18th, 21st, 24th coded symbols among a total of 32 encoded second symbols of 0th to 31st symbols when the number of first TFCI bits are 3 and the number of second TFCI bits are 7.

37. The apparatus as claimed in claim 33, wherein the first puncturing positions are 0th, 1st, 2nd, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded first symbols of 0th to 31st symbols and the second puncturing positions are 0th, 7th, 9th, 11th, 16th, 19th, 24th, 25th, 26th, 27th, 28th, 29th, 30th and 31st coded symbols among a total of 32 encoded second symbols of 0th to 31st symbols when the number of first TFCI bits are 4 and the number of second TFCI bits are 6.